at1117paper: Complete the Square (v318)

Example

A square's edge length is x feet. A rectangle has a height of x feet and a width of 36 feet. Their combined area, found by adding the square's area and the rectangle's area, is 405 square feet. What is the value of x?

Example's Solution

$$x^2 + 36x = 405$$

To complete the square, add $\left(\frac{36}{2}\right)^2 = 324$ to both sides.

$$x^2 + 36x + 324 = 729$$

Recognize the left side is now a perfect-square trinomial. Factor the left side.

$$(x + 18)^2 = 729$$

Undo the squaring.

$$x + 18 = \pm\sqrt{729}$$

$$x + 18 = \pm 27$$

Subtract 18 from both sides.

$$x = -18 \pm 27$$

In this geometric example, we are only concerned about the positive solution. So,

$$x = 9$$

Question 1

A square's edge length is x feet. A rectangle has a height of x feet and a width of 30 feet. The total area, of the square and rectangle, is 559 square feet. What is the value of x?

Question 2

A square's edge length is x feet. A rectangle has a height of x feet and a width of 34 feet. The total area, of the square and rectangle, is 552 square feet. What is the value of x?

Question 3

A square's edge length is x feet. A rectangle has a height of x feet and a width of 56 feet. The total area, of the square and rectangle, is 2241 square feet. What is the value of x?